

INtime® for Windows* Enables PCs for Advanced Motion Control

Aerotech selects INtime® software to power its A3200 Digital Automation Platform.



“The software’s robustness allows us to meet customers’ needs while allowing just about any Intel* processor to be used.”

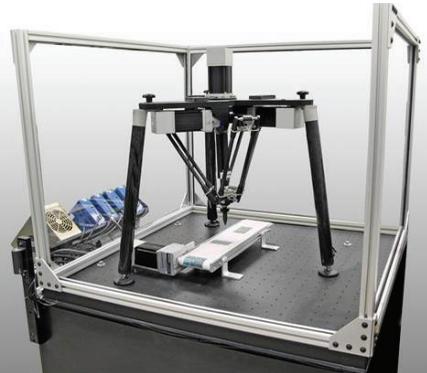


Figure 1. Delta robot demonstration system

Using a PC for an automation controller, delivers state of the art processing capabilities at competitive prices. Aerotech’s PC-based A3200 Digital Automation Platform uses TenAsys Corporation’s INtime® for Windows* to enable real-time control tasks to be executed alongside operator interface and program development functions on the same PC.

Overview

Aerotech Inc. of Pittsburgh, Pennsylvania is a leader in providing motion control systems to industrial end users, integrators and OEMs. Their systems serve applications that demand high precision, high repeatability and high throughput in markets such as medical device manufacturing, laser-based measurement and control systems, military equipment, semiconductor processing, test & measurement, R&D and general automation. In some of its motion products, Aerotech leverages the PC software platform as the main computing engine, with system integrators tailoring the hardware configuration to meet the specific needs of each customer.

Challenge

There are limitations to what a PC can do with Windows as the only OS. By itself, the PC platform with Windows* is not able to control many time-critical processes, since Windows is not a deterministic operating system. Without determinism, there’s no guarantee that the system will respond predictably to stimuli in exactly the same way each machine cycle, and hence the machine may not perform reliably. Windows’ standard task scheduler optimizes for processor usage and has no way of preventing housekeeping functions from disrupting the processing of time-critical tasks. At power-on, when Windows loads, it takes control of all of the I/O resources of the processor, making physical I/O devices compete with other system hardware such as disk drives, timers, etc. for CPU cycles. In order to leverage the performance and flexibility of the PC platform in control applications, without compromising the ability to run the huge base of PC-compatible software without modification, a software solution is needed that enables real-time task processing to coexist alongside the Windows application environment. Aerotech was faced with this challenge as they looked for operating environments to support the company’s A3200 Digital Automation Platform.

Solution

The optimal solution is to support a means for real-time tasks to communicate directly with I/O devices without involving Windows’ tasking mechanism. After a search of available real-time operating systems (RTOSes), Aerotech selected INtime for Windows.

INtime brings deterministic processing to Windows systems using a technique called embedded virtualization. With embedded virtualization, the I/O resources of the processor are partitioned at system startup so that Windows is restricted from controlling the I/O devices that are required by the RTOS. No modifications are required to Windows or any Windows applications.

Figure 2 shows the software architecture of Aerotech's A3200 Digital Automation Platform. In the A3200, Windows runs the motion programming environment and the data acquisition software, while INtime software supports all the real-time motion control functions. "Partitioning applications has made our customers feel more comfortable," said Joe Profeta, Aerotech Director of Control Systems. "They trust that their time-critical processing won't be affected by Windows tasks."

Since customers are beginning to standardize around Windows' 64-bit platform, INtime software also fulfills Aerotech's need for 64-bit processing on the Windows side and provides built-in support for partitioning tasks onto multi-

core processors. "The TenAsys software will run on a wide array of processors and platforms," said Joe Profeta. "The software's robustness allows us to meet customers' needs without being too restrictive about which Intel processor to use."

Results

The combination of real-time tasking with flexible Windows application processing make Aerotech's platform well-suited as a basis for new machine control applications as well as machine control system retrofits, replacing aging control systems with modern ones that are easier to use and may have more capabilities. The flexibility and openness of the PC provides users with the ability to integrate any of the other software or hardware into the machine control process. Users can also easily size the PC for their application computing needs.

One of Aerotech's customers, Integrated Industrial Technologies (I2T) of Pittsburgh, Pennsylvania, is a value-added reseller and system integrator of the Aerotech A3200 software

motion engine. I2T, with its software and industry expertise, has developed intuitive upgrades for many industrial applications including milling, grinding and gantry robots. "By using a Windows-based solution we are able to use common development tools to create a rich user experience that can be customized to each solution that we provide," said Mike Joyce, I2T Vice President of Engineering. "With the A3200 software environment, the motion control application has access to all of the computer's resources allowing the control software to be tightly integrated with file access, databases, communication networks or any other peripheral that is installed into the PC."

"The amount of processing power today on a PC has made our controller so much more powerful," concludes Joe Profeta. "The standard PC's continuous improvements in cost/performance help us respond to customers' needs for best-fit solutions, cost-effectively, in the shortest amount of time, but we need a real-time environment that works with it. And for that, TenAsys' INtime for Windows has met our needs."

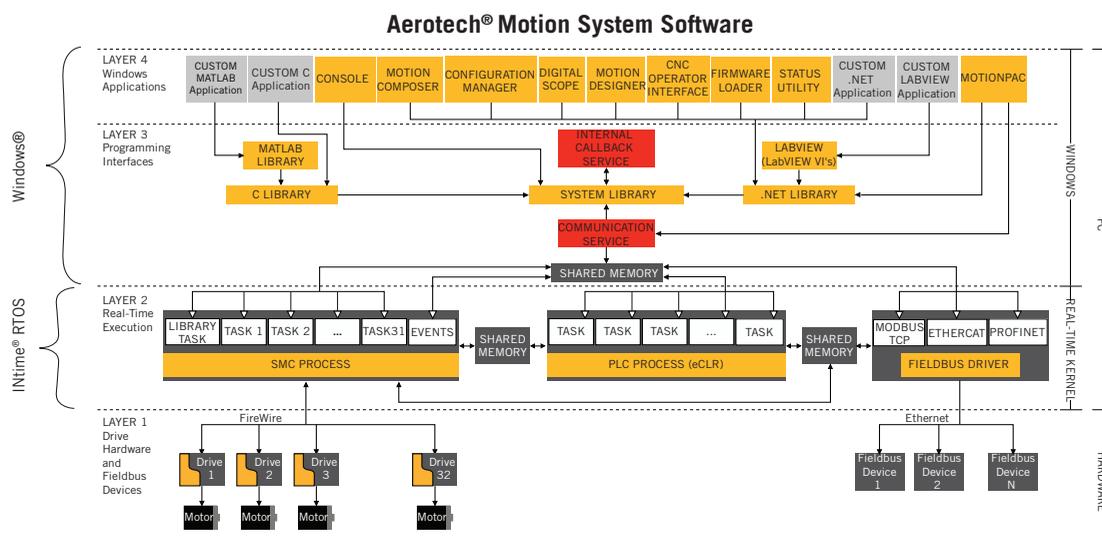


Figure 2. Aerotech's A3200 software architecture isolates Windows and real-time applications to provide full Windows functionality while ensuring determinism in control operations. All the necessary interfaces to design, diagnose, optimize and setup a motion control system application are run under Windows, while the resultant control code including the machine interfaces is run in real-time under TenAsys' INtime for Windows.

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